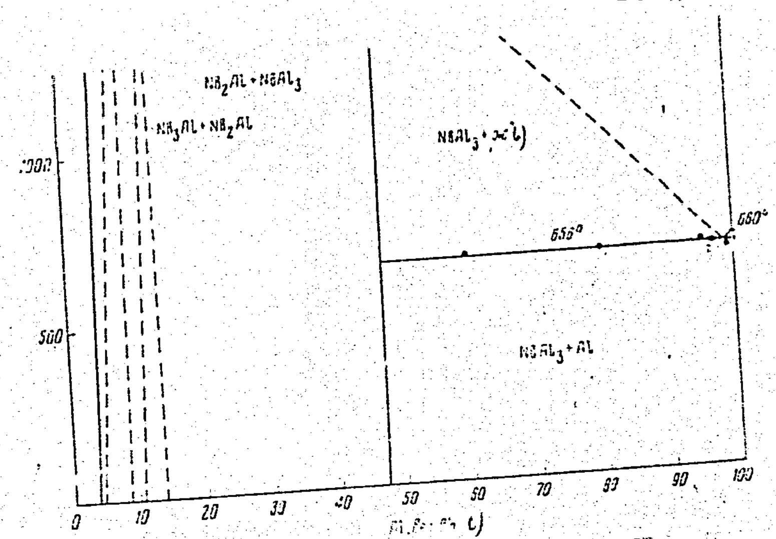
88474
S/078/61/006/001/009/019
B017/B054



Legend to Fig.1: a) = atom%; b) = liquid; c) = % by weight

Card 4/4

21755

S/078/61/006/005/014/015
B121/B208

18.1235 1496, 1454, also 1555

AUTHORS: Terekhova, V. F., Markova, I. A., and Savitskiy, Ye. M.

TITLE: Phase diagram of alloys of the system chromium - yttrium

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 5, 1961, 1252 - 1253

TEXT: The physico-chemical reaction of chromium with yttrium and the effect of yttrium on the strength and plasticity of chromium was studied. Electrolyte chromium with a purity of 99.5% and metallic yttrium with a purity of 97%, contaminated by tantalum, niobium, and rare earths, were the starting materials for preparing the alloys. The alloys were prepared in a furnace heated by an electric arc in helium atmosphere. 23 alloys with 0.1, 0.2, 0.3, 0.5, 1, 2, 3, 5, 10, 20, 30, 50, 60, 70, 80, 85, 90, 95, 99, 99.5, and 99.8 wt% yttrium were obtained. Microstructural analyses indicated the diphase structure in alloys with 0.4% yttrium and more. Yttrium with ~13% Cr forms a eutectic at 1315 ± 7°C. Chromium and yttrium in liquid and solid state were found to be immiscible in the range of 15 - 70 wt% yttrium at a temperature of 1760 ± 25° C. The limited

X

Card 1/2

21755
S/078/61/006/005/014/015
B121/B208

Phase diagram of alloys of ...

solubility of yttrium in solid chromium was studied by hardening the samples at 1100, 1500, and 1700°C and subsequent measuring of the microhardness and thermo-emf. The solubility of yttrium in solid chromium at 110°C is about 0.5 wt% yttrium, and at 1700°C about 1 wt% yttrium. X-ray analysis disclosed that no chemical compounds appear in yttrium - chromium alloys with 30 and 70 wt% yttrium. In the system chromium—yttrium the immiscible range is narrower than in the systems chromium - lanthanum and chromium - cerium, also the range of solid solutions. The resistance to corrosion and the plasticity of chromium at temperatures up to 1200°C are improved by adding yttrium to chromium up to 2 wt%. The results obtained by studying the effect of yttrium on the strength and plasticity of chromium will be reported later on. There are 1 figure, 1 table, and 5 Soviet-bloc references.

SUBMITTED: November 9, 1960

21756

S/078/61/006/005/015/015
B121/B208

18.1285 1416, 1454, also 1418

AUTHORS: Savitskiy, Ye. M. and Burkhanov, G. S.

TITLE: Phase diagram of alloys of the system titanium - scandium

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 5, 1961, 1253 - 1255

TEXT: In the present paper the phase diagram of titanium - scandium alloys was studied for the first time. The initial materials were metallic titanium with a purity of 99.7 % prepared by the iodide method, and 96 % pure scandium. The main impurities in scandium were yttrium and rare earth elements (2.5%), tantalum (1%), and molybdenum (0.2%). The titanium-scandium alloys were prepared in a furnace heated by an electric arc and furnished with tungsten electrodes, in helium atmosphere. The following alloys were produced: Ti - 1.5% Sc, Ti - 2% Sc, Ti - 5% Sc, Ti - 10% Sc, Ti - 40% Sc, Ti - 60% Sc, Ti - 80% Sc, Ti - 90% Sc, Ti - 95% Sc, and Ti - 98% Sc. Titanium and scandium in liquid state are soluble in each other to an unlimited extent, at 1440°C eutectic crystallization of the

X

Card 1/2

21756

S/078/61/006/005/015/015
B121/B208

Phase diagram of alloys ...

alloys occurs. In the alloys on the side of titanium the melting point is lowered and the temperature of the polymorphous conversion $\alpha \rightleftharpoons \beta$ of titanium is slightly increased by the addition of scandium to titanium. Scandium resembles the other rare earths and stabilizes the α-phase of titanium. The solubility of scandium in α-titanium at 700°C is 2 wt%. A second phase appears on addition of more than 2 wt% scandium. Addition of titanium to scandium reduces the temperature of the polymorphous conversion of scandium from 1450 to 1330°C. Eutectic crystallization occurs at 1440°C. The alloys in the two-phase range at temperatures up to 900°C consist of a solid solution of scandium in α-titanium and of titanium in α-scandium. Metallic compounds are not formed in the system Ti - Sc. There are 2 figures and 6 references: 4 Soviet-bloc and 2 non-Soviet-bloc. The reference to the English-language publication reads as follows: Ref. 5. F. H. Spedding, A. H. Daane, G. Wokefield, D. H. Dennison. Institute for Atomic Research and Department of Chemistry Iowa State University of Science and Technology. Amer. Iowa, Contribution no. 783, Work was performed in the Amer. Laboratory of the U. S. Atomic Energy Commission.

SUBMITTED: November 28, 1960

Card 2/2

18 9200

AUTHORS: Tylkina, M. A., Polyakova, V. P., Savitskiy, Ye. M.

TITLE: Phase diagram of the palladium - tungsten system

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 6, 1961, 1471-1474

TEXT: Publications only contain data on the formation of solid solutions of 22.6% by weight of tungsten in palladium and the absence of chemical compositions of both elements. The phase diagram (Fig. 1) of the palladium - tungsten system was drawn by determination of the fusing temperature, microscopic and X-ray phase analyses, measurements of hardness and microhardness of the phases as well as of the absolute thermo-emf. The initial substances of 99.9% Pd powder and 99.8% W powder were mixed, briquetted and sintered at 1300°C and 10^{-5} mm Hg, and then melted in the arc furnace in purified argon atmosphere. The fusing temperature was determined according to Ye. M. Savitskiy (Ref. 3: Zh. neorgan. khimii, 3, 815 (1958)) by the drop method in vacuum and with an optical pyrometer. For the phase analysis, the alloys were annealed at 10^{-5} mm Hg for 6 hr at 1500°C and for 400 hr at 1000°C, and then cooled

Card 1/4

21084
S/078/61/006/006/010/013
B110/B207

Phase diagram of the palladium - tungsten ...

by air. The X-ray investigation was made with Cu - Ka emission in the chamber of the type PKD (PKD). For the microscopic analysis, alloys with high Pd content were etched with 10 ml 50% HCl and 2 to 3 drops H_2O_2; alloys with high W content with a mixture of 2 parts of 5% $K_3Fe(CN)_6$ and 1 part of 10% KOH. The hardness was investigated in the Vickers apparatus with 5 kg; the microhardness of the phases in the PMT-3 (PMT-3) apparatus with 50 g and 20 g load. The absolute thermo-emf was determined according to A. A. Rudnitskiy (Ref. 4: Termoelektricheskiye svoystva blagorodnykh metallov i ikh splavov. Izd-vo AN SSSR Moskva 1956). Fig. 1a shows the phase diagram Pd-W. Fig. 1b the diagrams composition - properties. The diagram of the system Pd-W is peritectic (L + $\beta \rightleftharpoons \alpha$) 2175 ± 25°C with two limited zones of solid solutions. Microstructure and X-ray analyses produced monophase structure of the solid solution with face-centered cubes with lattice parameters (similar to Pd) of all alloys ≤ 23% by weight W. The alloy with 25% by weight W is a monophase solid solution at ≥ 1600°C; a second phase precipitates at lower temperatures. The fusing temperature of solid α-solutions rises from the palladium fusing point of 1552°C up to 2100°C for an alloy with 22% by weight W. The

Card 2/5

absolute thermo-emf of the solid α-solution changes sinusoidally. On the basis of tungsten, the zone of the monophase solid β-solution is much narrower. It amounts to 2% by weight Pd in the fusing point vicinity and drops to 1.6% by weight at 1500°C. In the cast state, the alloy with 98% by weight W shows a monophase solid solution. After quenching from 1500 and 1000°C, a second phase appears, which increases with decreasing temperature. Cubic W structure was determined for this phase by X-ray analysis. The α + β-diphase zone lying between the α- and β-zone clearly showed primary gray dendrite crystals of the solid β-solution, which were surrounded by the lighter α-solution. The β-portion rises with an increase of tungsten and the α-crystals only remain as narrow veins at the grain boundaries of the β-crystals. The microstrength of the α-solution amounted to about 220 kg/mm², that of the β-solution to about 440 kg/mm². The curve of the absolute thermo-emf, almost horizontal in the diphase region, dropped considerably at the transition to the region of the β-solution. The alloys in the region of the solid tungsten- and palladium solutions can be well shaped by cold processing, so that they may be used as potentiometric and corrosion-resistant materials. The authors thank Ye. N. Kunenkova for her collaboration. There are 2 figures, 1 table,

23084

S/078/61/006/006/010/013
B110/B206

Phase diagram of the palladium - tungsten ...

and 4 references: 3 Soviet-bloc and 1 non-Soviet-bloc.

SUBMITTED: December 23, 1960

Fig. 1: Diagram (α - β) of the phase and property of the palladium - tungsten system. Legend: 1) microhardness in kg/mm^2; 2) tempered at 1000°C; 3) cast; 4) W content in % by weight

(For Fig. 1 see Card 6/6

2300?

S/078/61/006/006/011/01?
B110/B206

18.9200 1454, 1555, 1418

AUTHORS: Savitskiy, Ye. M., Tylkina, M. A., Kirilenko, P. V., Kopetskiy, Ch. V.

TITLE: The phase diagram of the manganese - rhenium system

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 6, 1961, 1474-1476

TEXT: Since only provisional data are available on the manganese - rhenium system, the latter was checked by micro- and X-ray structural analysis, thermal analysis and investigation of the microhardness of the phases. Part of the results is given in the phase diagram (Fig. 1). Since the fusing point of rhenium at 3160°C lies much higher than the boiling point of manganese at 2090°C, Mn-Re alloys could only be melted up to 30 atom % Re in the vacuum induction furnace in Ar atmosphere. Electrolytic manganese (99.83%) and pressed rhenium powder (99.8%) sintered at 1500°C served as initial substances. Alloys with 0.2; 0.3; 0.5; 1.87; 2.64; 3.1; 5.56; 9.65; 10.72; 17.05; 20.42; 22.9 and 32.1 atom % rhenium content were investigated. Hardening was done at 950°C for 100 hr. It was established by microstructural analyses that α-Mn dissolves up to

Card 1/4

23085

S/078/61/006/006/011/013
B110/B206

The phase diagram of the ...

5.5 atom % Re. From this content on, the structure of the alloy is a diphase one. The σ-phase (52.24 atom % Re) forming during the peritectic reaction is separated dendritically and increases with increasing rhenium content. The radiographs, the results of which coincide with those of the microstructural analysis, were taken in the РКУ (RKU) and РКД (RKD chambers with CrK_{α} - and $V\ K_{\alpha}$ emissions. The structure of the solid solution is that of α-manganese. The parameter of its crystal lattice changed from 8.894 kX (pure Mn) to 8.924 kX at a 5.56 atom % Re content and then remains constant. From about 9.5 atom % Re, interferences of the σ-phase which increase with increasing Re concentration can be observed. The parameters of the crystal lattice of the α-phase with 22.9 atom % Re are: a = 9.11 kX; c = 4.92 kX; c/a = 0.54. No β-Mn interferences were established. The thermal analysis was made with the W-Re thermocouple ВР 5/20 (VR 5/20) according to the method described by the first author: Dokl. AN SSSR, 129, 559 (1959). It was established that rhenium admixtures > 5.54 atom % lead to the increase of all temperatures of the polymorphous transitions and the fusing temperature of Mn-Re. The temperature of formation of the σ-phase (presumably < 1700°C) could not be determined. The analogous metals of the VIIth

Card 2/4

23085

The phase diagram of the ... S/078/61/006/006/011/013
B110/B206

group of the periodic system rhenium and manganese form, against the rule, no continuous series of solid solutions. The σ-phase forms at 52.24 atom % Re content, the range of solid solutions only goes up to 5.5 atom % Re content. This probably produces the relationship of the α- and β-modifications of Mn forming at low temperatures, with the intermetallic compounds (χ- and T phases) on the basis of its interatomic bond type, the crystalline and physical properties. In contrast to Ti, Zr, Nb and Ta, rhenium is soluble in α-Mn up to 5.5 atom %, and the structure of the β-modification is not undercooled. This confirms the favorable value of the size factor of Re as a cause for its solubility. There are 2 figures and 4 Soviet-bloc references.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Metallurgical Institute imeni A. A. Baykov, AS USSR)

SUBMITTED: November 9, 1960

Card 3/4

26735
S/078/61/006/007/013/014
B121/B207

X

21.2500

AUTHORS: Savitskiy, Ye. M., Terekhova, V. F., Burov, I. V., and Chistyakov, O. D.

TITLE: Phase diagram of the alloys of the system gadolinium-iron

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 7, 1961, 1732 - 1734

TEXT: The phase diagram of the alloys of the system gadolinium-iron was drawn up in all ranges of concentrations on the basis of physico-chemical analyses (thermal-, microstructural analysis, determination of hardness and microhardness, phase analysis, X-ray analysis and dilatometric studies). The alloys were prepared from distilled iron (99.9 %) and metallic gadolinium (99.0 %). The solubility of gadolinium in iron and of iron in gadolinium at room temperature does not exceed 0.2 - 0.3 % by weight. Alloys with 1 % by weight Gd already contain the phase of the $Fe_{17}Gd_2$ compound (24.8 % by weight Gd). The alloys with 25 % by weight and 58 % by weight Gd are completely one-phase in accordance with the compounds $Fe_{17}Gd_2$ (24.8 % by weight Gd) and Fe_2Gd (58.41 % by weight Gd). The alloys

Card 1/4

21735
S/078/61/006/007/013/014
B121/B207

Phase diagram of...

with 12 % by weight Fe form a eutectic. $Gd_{solid\ solution} + Fe_2Gd$, which melts at 830 ± 7°C. An addition of Gd to the iron alloys, solidifies α-iron in the region of the solid solution. The alloys containing 15 - 60 % by weight Gd are brittle. Thermal analysis was carried out in an experimental plant for high temperatures in vacuum and inert atmosphere. On the basis of the thermal analysis, the compounds Fe_2Gd and $Fe_{17}Gd_2$ were found to form by peritectic reactions at 1080 °C and 1335 ± 10°C. The structure of $Fe_{17}Gd_2$ which has a triclinic syngony (structu type Th_2Zn_{17}) was determined by X-ray analysis and the lattice parameters were found to be a = 8.519 ± 0.003 kX, c = 12.404 ± 0.005 kX and c/a = 1.456. The compound Fe_2Gd has cubic syngony with the lattice parameter a = 7.43 kX. Admixtures of Gd (up to 3 % by weight) slightly increase the temperature of the polymorphous transformation of α into γ. The solubility limit line of Fe and Gd was not determined. A study of the magnetic properties of the alloys up to 58 % by weight Gd shows that by a Gd addition of up to 0.2 % by weight a slight increase of magnetic

Card 2/4

24735

S/078/61/006/007/013/014
B121/B207

Phase diagram of...

saturation ($4\pi Is$) is favored. Fig. 2 shows the phase diagram of the system iron-gadolinium. P. I. Kripyakevich determined the crystal structure of the $Fe_{17}Gd_2$ compound. There are 2 figures and 4 references: 2 Soviet-bloc and 2 non-Soviet-bloc. The references to English-language publications read as follows: M. Hansen, Constitution of binary alloys, New York - London, 1958. Jr. K. A. Gschneider, J. T. Waber. Principles of alloying behavior of rare earth metals. Presented of American Society for Metals Atomic Energy Commission Symposium of the Rare Earths and Related Metals, Chicago Illinois, November, 3, 1959.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

SUBMITTED: January 28, 1961

Card 3/4

24735
S/078/61/006/007/013/014
B121/B207

Phase diagram of...

Legend to Fig. 2: a) atom % Gd, b) liquid, c) % by weight Gd

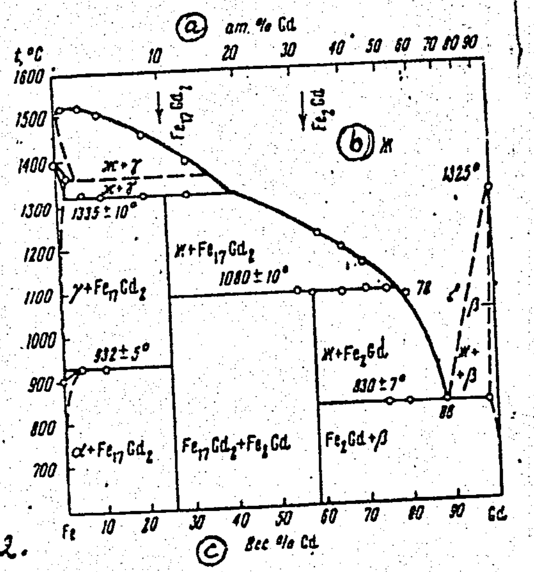


Fig. 2.

Card 4/4

S/078/61/006/007/014/014
B121/B207

21.2500

AUTHORS: Savitskiy, Ye. M., Terekhova, V. F., Burov, I. V., and Markova, I. A.

TITLE: The phase diagram of the compounds of the magnesium-gadolinium system

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 7, 1961, 1734 - 1737

TEXT: The phase diagram of the compounds of the system Mg - Gd was drawn up on the basis of physico-chemical analyses (determination of the microstructure, hardness and microhardness, thermal and X-ray studies). The alloys were produced from distilled Mg (99.99 %) and metallic Gd (99 %). The alloy with 26 % by weight Gd forms a eutectic at 545 ± 7°C. The existence of four chemical compounds, i. e., Mg_9Gd, Mg_3Gd, Mg_2Gd, and MgGd was proved on the basis of microstructural and X-ray analyses. The compounds Mg_3Gd (68.2 % by weight Gd) and MgGd (86.2 % by weight Gd) have a cubic lattice with the parameters 7.30 kX and 3.77 kX. The

Card 1/3

24730
S/078/61/006/007/014/014
B121/B207

The phase diagram of...

compound Mg_2Gd (78 % by weight Gd) has a cubic structure of the $MgCu_2$ type. In alloys which are richer in Gd, the existence of the compound $MgGd_2$ is also assumed. The solubility of Gd in Mg at the eutectic temperature amounts to 2 - 2.5 % by weight Gd. The solubility at room temperature is not higher than 1 - 1.5 % by weight Gd. The solubility of Mg in solid Gd was not determined owing to insufficient purity of the Gd metal. An addition of Gd to Mg increases the stability of the latter. The hardness of the alloy with 7 % by weight Gd amounts to 57 kg/mm^2. The phase diagram of the system magnesium-gadolinium is shown in Fig. 2. Ye. N. Kunenkova made the chemical analysis of the alloys. P. I. Kripyakevich assisted in the X-ray analysis. There are 2 figures and 5 references: 3 Soviet-bloc and 2 non-Soviet-bloc.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

SUBMITTED: January 28, 1961

Card 2/3

APPROVED FOR RELEASE: 03/14/2001 CIA-RDP86-00513R001447420001-8"

26736
S/078/61/006/007/014/014
B121/B207

The phase diagram of...

Legend to Fig.2: a) atom % Gd; b) liquid; c) % by weight Gd.

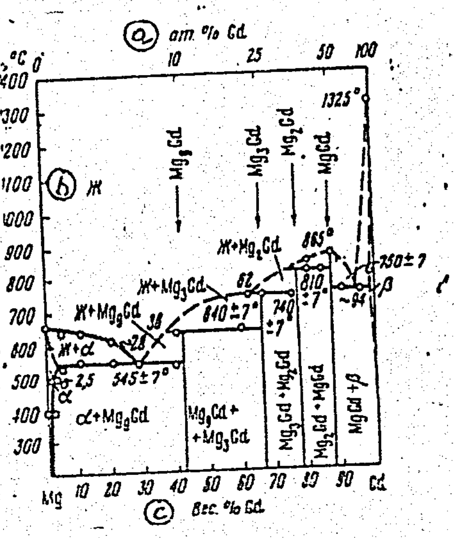


Fig.2.

Card 3/3

S/078/61/006/008/0?2/018
B127/B220

25513

18.1235

AUTHORS: Savitskiy, Ye. M., Terekhova, V. F., Birun, N. A.

TITLE: Phase diagram of the system ruthenium-chromium

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 8, 1961, 1960-1962

TEXT: This system was studied in order to find out the physico-chemical interaction between chromium and an element of group VIII, particularly because the favorable effect of ruthenium on the temperature decrease occurring when chromium changes from the brittle to the plastic state was known. From the literature it is evident that the following ruthenium-chromium compounds are known: σ-phase of the composition Cr_2Ru, a phase Cr_3Ru crystallizing according to type β-W, and a phase with unknown lattice of the probable composition Cr_4Ru. The solubility of chromium in ruthenium is 50at% and that of ruthenium in chromium 26at%. Electrolytically precipitated pure chromium and ruthenium of 99.8% purity were used for preparing the alloys. They were fused in an arc furnace with tungsten electrodes and in a helium atmosphere. The melting temperature

Card 1/3

25513 S/078/61/006/008/012/018
B127/B220

Phase diagram of the...

was determined by the capillary method in an argon atmosphere. Gradual tempering was effected as follows: 100°C:100 hr; 900°C:75 hr; and 700°C:75 hr. Then, the mass was left to cool in the furnace. For tempering the alloys were maintained 20 hr at 1200°C, 24 hr at 1000°C, and 48 hr at 800°C in evacuated quartz ampullae with subsequent tempering in cooled ampullae. Hardness was measured with a Vickers apparatus at a pressure of 10 kg, and microhardness with a ПМТ-3 (PMT-3) apparatus at a pressure of 100 g. The test results (melting point, microstructure and x-ray analysis, hardness and microhardness, thermo-emf) are shown in Fig. 1. According to E. I. Gradyshevskiy, the compound Cr_3Ru has a β-W lattice with a = 4.673 Å. The hardness of the alloy increases with increasing content of ruthenium from 150kg/mm² to 500kg/mm² for alloys with 40% of ruthenium. The first crystals of the α-phase were observed at 1470°C. The parameters obtained for the σ-phase are: a = 9.10Å, c = 4.66Å, c/a = 0.513. The hardness of the alloy with 50% by weight of Ru (34at.%) varied between 600 and 1000 kg/mm², and the microhardness was 1200 kg/mm². There are 2 figures and 6 references: 5 Soviet-bloc and 1 non-Soviet-bloc. The reference to the English-language publication reads as follows: Ref. 6: P. Greenfield, P. Beck. J. Metals. February, 1956.

Card 2/3

S/078/61/006/008/013/018
B127/B220

18.1210 2408 25514

AUTHORS: Savitskiy, Ye. M., Tylkina, M. A., Povarova, K. B.

TITLE: Phase diagram of aluminum-rhenium

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 8, 1961, 1962-1965

TEXT: A compound of the type CsCl is known to the authors from the literature: AlRe, a = 2.88Å. The alloys were prepared from 99.8% Re and AB-000 (AV-000), i. e., 99.9% aluminum. The plotting of the diagram is rather difficult, since the weights (Al: 2.7; Re: 21.02), the melting points (Al: 660°C; Re: 3170°C), and the boiling points (Al: 2060°C; Re: 5870°C) are very different. Alloys containing 13.6 - 86.3 % by weight of Re were prepared in an arc furnace with water-cooled tungsten electrodes in an argon atmosphere at a pressure of 400 mm Hg and remelted 4 - 5 times in order to obtain a homogeneous phase. Alloys containing 0 - 6% of Re were fused in an induction furnace with NaCl as flow medium from aluminum and alloys containing 37% of Re in corundum crucibles. Alloys containing 88.5 - 99.6% of Re were fused from rhenium and compounds containing 74.5% of Re in the arc furnace. The melting point of alloys containing 74.5 -

Card 1/4

25514

S/078/61/006/008/013/018
B127/B220

Phase diagram of...

99.6% of Re was determined using the capillary method and an optical pyrometer. The compounds enriched with aluminum were tested with a special device recording the thermogram on heating and cooling by means of a Kurnakov pyrometer. A high-temperature thermocouple W - 3% Re/W - 15% Re was used. Thermal analysis was effected in a vacuum furnace with tungsten heaters and helium atmosphere. Alloys containing 0 - 82.5% of rhenium were tempered in evacuated quartz ampullae for 500 hr at 570°C, and alloys containing 74.5 - 99.6% of Re for 100 hr at 1000°C, for 5.5 hr at 1300°C, and for 1.5 hr at 1600°C and 10^{-4} mm Hg. The Brinell hardness of alloys with 0 - 60% of Re was measured with 2.5 mm balls and at a pressure of 31.25 kg. Moreover, the hardness of the alloys was measured by means of a Vickers diamond at a pressure of 10 kg, and with a ПМТ-3 (PMT-3) diamond at pressures of 20 and 50 g. The χ-phase of the diagram corresponds to the α-phase of manganese. The lattice parameter a = 9.85 Å, the space group I43 m- L_d^3. The microhardness is 800 kg/mm^2. Al_2Re has a microhardness of 1000 kg/mm^2. $Al_{12}Re$ has a microhardness of 360 kg/mm^2 and the same structure as $Al_{12}W$ or $Al_{12}Mo$ with cubic structure. The lattice parameter a = 7.528 ± 0.001 Å, the space group Im3-T_h^5. There are

Card 2/4

25514.

S/078/61/006/008/013/018
B127/B220

Phase diagram of...

2 figures and 4 Soviet-bloc references.

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

SUBMITTED: February 17, 1961

Card 3/4

29533
S/078/61/006/011/011/013
B101/B147

18.1280

AUTHORS: Savitskiy, Ye. M., Baron, V. V., Khotinskaya, A. N.

TITLE: Phase diagram of the system niobium-palladium

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 11, 1961, 2603-2605

TEXT: The present paper deals with the examination of hardly fusible alloys on the basis of hardly fusible rare metals and precious metals. The phase diagram of the system Nb-Pd was determined (Fig. 2a). The compound Nb_2Pd forms on the basis of the peritectic reaction liqu + $\beta \rightleftarrows Nb_2Pd$ (β = solid solution based on Nb) at $1650 \pm 25^{o}C$. It has a tetragonal σ-phase crystal lattice. The lattice constants are: a = 0.98 Å, c = 5.11 Å; c/a = 0.52. [Abstracter's note: One of the data given for a, c, and a/c is wrong. From a and c it follows that c/a = 5.2.] The hardness of Nb_2Pd is 578 kg/mm^2, and its microhardness is 645 kg/mm^2. The compound is brittle. The Kurnakov compound Pd_3Nb forms from the melt

Card 1/2

at 1700°C. The crystal structure of this phase is being studied by Ye. I. Gladyshevskiy and P. I. Kripyakevich. Hardness is 225 kg/mm^2, microhardness 321 kg/mm^2. The existence of these compounds is expressed in the curves plotted for the various properties of the alloys: thermo emf (Fig. 2б), hardness (Fig. 2в), and oxidation rate (Fig. 2г). There are 2 figures and 3 references: 1 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: P. Creenfild, P. Beck, Trans. AIME, 206, 265 (1956); A. C. Knapton, J. of the Less Common Metals, 2, 113 (1960).

ASSOCIATION: Institut metallurgii Akademii nauk SSSR (Institute of Metallurgy of the Academy of Sciences USSR)

SUBMITTED: March 11, 1961

Fig. 2. System Nb-Pd. (a) Phase diagram; (б) absolute thermo-emf; (в) Vickers hardness of tempered samples; (г) oxidation rate at 1200°C. Legend: (1) atom% of Nb; (ж) liquid; (2) thermo-emf, μv/°C; (3) H_V, kg/mm^2; (4) oxidation rate, mg/cm^2·hr; (5) Nb, % by weight.

Card 2/2

30182
S/078/61/006/012/009/011
B124/B110

18.8100

AUTHORS: Savitskiy, Ye. M., Pravoverov, N. L.

TITLE: The strain-sensitivity coefficient as a method of physico-chemical analysis

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 6, no. 12, 1961, 2776-2780

TEXT: The strain-sensitivity coefficient represents the ratio of electrical conductivity on deformation to the respective elongation, $S = (\Delta R/R)/(\Delta l/l)$, where R is the electrical conductivity and l the length of the sample; it depends on the chemical constitution and on the previous mechanical and thermal treatment of the metal. The raw materials of the samples were prepared by melting 99.98% Pd, 99.99% Ag, 99.98% Pt, and 99.97% Rh in an induction furnace under a layer of molten borax to give Pd-Ag alloys containing 15, 30, 35, 40, 45, 50, 55, 60, and 85 atom % of Ag, and Pt-Rh alloys containing 1, 2, 3, 10, 13, 20, and 30 atom % of Rh. Castings made of Pd-Ag were worked at 1100°C, and those made of Pt-Rh at 1300°C. Then, the alloys were rolled on intermediate annealing at 900 - 1000°C, and drawn to wires with 0.3 mm in diameter. The diagrammatic

X

Card 1/3

30182
S/078/61/006/012/009/011
B124/B110

The strain-sensitivity...

sketch of the setup used to measure the value of the coefficient S is shown in Fig. 1, while the holder used to fasten the sample is shown in Fig. 2. The sample should be loaded in the elastic region, when reproducible values of the coefficient S are to be obtained. The elongation of the sample due to a certain force applied, and the ratio $\Delta R/R$ have been measured. The variation of $\Delta R/R$ with elongation is linear for Pd-Ag alloys (Fig. 3); the slope of the straight line depends on the composition of the alloys, and the tangent of the slope angle to the x-axis represents the coefficient S. The variation of the coefficient S with the composition of the alloys (curve S) is also shown in this Figure. The presence of N. S. Kurnakov phases with the compositions Ag_2Pd_3 and AgPd is confirmed by the singularity of the maximum at 40 atom % of Ag and by the inflection point at 50 atom % of Ag. The linear variation of $\Delta R/R$ with deformation and the variation of the coefficient S with the composition of the system Pt-Rh is shown in Fig. 4. The latter dependence has the shape of a smooth curve which confirms the presence of metastable solutions fixed by hardening in the system. Pure metals and ordered phases exhibit maximum strain-sensitivity coefficient values. When the sample is exposed to ultimate stresses, the normal moduli of elasticity, yield stresses,

X

Card 2/3

and strength limits can be determined, in addition to the coefficient S, when the described method is used. O. A. Novikova (Ref. 10: Zh. neorgan. khimii 4, 1596, 1601 (1959)) is mentioned. There are 4 figures and 10 references: 7 Soviet and 3 non-Soviet. The reference to the English-language publication reads as follows: W. H. Aarts, A. S. Houston, Acta Met., 1957^5 - 525/27).

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

SUBMITTED: May 16, 1960

Fig. 1. Diagrammatic sketch of the setup used to measure the strain-sensitivity coefficient.

X

Legend: (1) sample; (2) holders (3) dial gauges; (4,5,6) levers; (7) nut; (8) screw; (9) indicator; (10) loading scale; (11) electric part of the measuring device.

DASHKOVSKIY, A.I.; SAVITSKIY, Ye.M.

Internal friction in strontium. Fiz. met. i metalloved. 11 no.5:811-812 My '61. (MIRA 14:5)
(Internal friction) (Strontium)

31742
S/136/61/000/012/006/006
E193/E383

18.1220

AUTHORS: Savitskiy, Ye.M. and Vlasov, A.I.

TITLE: Increasing the strength of copper by finely-dispersed particles

PERIODICAL: Tsvetnyye metally, no. 12, 1961, 77 - 81

TEXT: In view of the growing interest in the dispersion-hardened metal-metal oxide systems (e.g. $Cu-Al_2O_3$), the present authors have studied the structure, electrical-resistance and mechanical properties of Cu with additions of Al_2O_3, TiC or TiB_2. The characteristics of the raw materials are given in Table 1. One series of experimental specimens (Cu + up to 1% Al_2O_3) was prepared by treating metallic copper with an aqueous solution of aluminium oxychloride. Other specimens were prepared from the respective powder mixtures which, after preliminary 60-min treatment in hydrogen at 350 °C, were compacted, sintered and extruded to 17 and 21 mm diameter rods. Specimens of series I (in which Al_2O_3 particles were

Card 1/ 8

31742

S/136/61/000/012/006/006
E193/E383

formed by decomposition of aluminium oxychloride) were characterized by the smallest partice-size and most uniform distribution of the oxide particles. Alumina introduced as such was much coarser and the particle-size of TiC was larger still. Other properties of extruded materials are given in Table 2. In the next series of experiments, recrystallization characteristics of the alloys were studied by taking hardness measurements on specimens annealed for 1 hour at various temperatures. The results are reproduced in Fig. 3, where the hardness (H_v, kg/mm^2) is plotted against the annealing temperature (^oC) for specimens with 1 - 1% Al_2O_3 (series I), 2 - 1% Al_2O_3 (series II), 3 - 0.4% Al_2O_3 (series I) and 4 - pure copper. Similar graphs, reproduced in Fig. 4, were constructed for 1 - pure copper, 2 - 3% TiC, 3- 5% TiC, 4 - 10% TiC, 5 - 3% TiB_2, 6 - 5% TiB_2 and 7 - 10% TiB_2.

31742
S/136/61/000/012/006/006
 E193/E383

It will be seen that, in contrast to pure copper, the dispersion-strengthened alloys do not recrystallize even when heated to the top limit (900 °C) of the temperature range studied. The temperature-dependence of strength of dispersion-hardened alloys was studied in the final stage of the present investigation. The results are reproduced in Fig. 5, where UTS (σ, kg/mm^2) at temperatures indicated by each curve, is plotted against the Al_2O_3 content of the material, the broken and continuous curves relating, respectively, to specimens of I and II series. UTS of dispersion-hardened alloys at 30, 400 and 600 °C is plotted in Fig. 6 against the TiB_2 (continuous curves) and TiC (broken curves) content. The best combination of properties was obtained in the alloy with 1% Al_2O_3, present in the form of colloidal-size particles formed as a result of decomposition of aluminium oxychloride. The UTS of this material at room temperature and at 600 °C was 35 - 37 and 14 - 15 kg/mm^2, respectively, although its electrical conductivity was practically equal to that of pure copper.

33454

18.1152 1521

S/126/61/012/006/012/023
E193/E383

AUTHORS: Savitskiy, Ye.M. and T'ao Tsu-ts'ung

TITLE: Deformation and recrystallization textures in the Mo-35 at.% Re alloy

PERIODICAL: Fizika metallov i metallovedeniye, v.12, no.6, 1961, 879 - 882

TEXT: Addition of Re to Mo brings about an increase in its cold workability and high-temperature strength. In the present paper the results of X-ray diffraction studies of deformation and recrystallization textures in the Mo-35 at.% Re alloy are reported. The experimental specimens (wire 0.2 mm diameter and foil 0.08 mm thick) were prepared from argon-arc melted and homogenized material by cold working to 92 and 97% reduction without intermediate annealing. Cold-worked specimens, vacuum-annealed for 1 h at temperatures ranging from 1 150 to 1 750 °C were used for studying the recrystallization texture. The results of the analysis of pole figures constructed for the alloy studied can be summarized as follows.

Card 1/3

33454
S/126/61/012/006/012/023
E193/E383

Deformation and ....

1) The recrystallization temperature of the Mo-35 at.% Re alloy is 1 450 °C, against 935 °C for pure molybdenum.
2) Both cold-drawn and annealed wire specimens have the <110> texture, similar to that of wire specimens of other metals with body-centered cubic crystal lattice.
3) The deformation texture of foil specimens comprises two principal orientations {111}<110> and {112}<110>, and two weak components {100}<110> and {111}<112>. This texture is different from that of pure, cold-rolled Mo in that it contains a strong {111}<110> component and a much less pronounced {100}<110> orientation. This difference is probably due to different mechanism of plastic deformation.
4) A complex recrystallization texture of foil specimens comprises {112}<110>, {100}<110> and {111}<110> preferred orientations.

Card 2/3

33454

Deformation and S/126/61/012/006/012/023
E193/E383

There are 6 figures and 8 references: 3 Soviet-bloc and 5 non-Soviet-bloc. The four latest English-language references are: Ref. 3: R.I. Jaffee, C.T. Sims, J.J. Harwood, Plansee Proceeding, 1958; Ref. 4: C. Feng, Trans. AIME, 1960, Feb., 192; Ref. 2: G.A. Geach, I.E. Hughes - Plansee Proceeding, 1955; Ref. 7: C.S. Barrett - Structure of Metals, McGraw-Hill, London, 1952.

ASSOCIATION: Institut metallurgii AN SSSR
(Institute of Metallurgy of the AS USSR)

SUBMITTED: April 17, 1961

X

Card 3/3

26392
S/032/61/027/008/017/020
B124/B215

18 9500 1043 1160

AUTHORS: Savitskiy, Ye. M., Kopetskiy, Ch. V., Pekarev, A. I., and Novosadov, M. I.

TITLE: Device for zone melting of high-melting metals and alloys by electron bombardment

PERIODICAL: Zavodskaya laboratoriya, v. 27, no. 8, 1961, 1041 - 1042

TEXT: A device for zone melting (Fig. 1) was designed in the Laboratoriya redkikh metallov i splavov Instituta metallurgii AN SSSR (Laboratory of Rare Metals and Alloys of the Institute of Metallurgy, AS USSR) on the basis of western papers (A. Calverley, M. Davis, R. F. Lever, J. Sci. Inst., 34, 4, (1957); H. R. Smith, J. of Metals, 11, 2 (1959)). This device may be used to obtain single-crystal rods 150 - 200 mm long and 3 - 5 mm in diameter for use in radioelectronics, in the manufacture of precision instruments, and for research purposes. In electron bombardment, a zone is melted with a width approximately equal to the diameter of the specimen serving as anode. The liquid metal is kept in the melted zone by means of surface tension. The above method permits

Card 1/5

26392
S/032/61/027/008/017/020
B124/B215

Device for...

the purification of rods 12 - 14 mm in diameter. The support 2 for fixing the specimen 3 is placed on the water-cooled plate 1. Tantalum springs which permit free expansion of the specimen during heating, are used for fixing the specimen in perpendicular position between the molybdenum clamps 4. The support with the fixed specimens is insulated from the plate and serves as an anode. The cathode is a loop of tungsten filament 0.6 - 0.7 mm in diameter, or is made of tantalum foil. It is fixed in position by the holders 5 made of steel. The cathode is heated by a charged copper wire connected to the holders. The support with the cathode holders is adjusted by a guide nut which is driven out of the working chamber by a conical, vacuum-tight, mobile device. One cathode holder and the plate are earthed. The electrons emitted from the cathode are focused by means of two parallel molybdenum plates placed at a distance of 4 - 5 mm from each other. The plates have 5 - 7 mm openings. The whole working chamber is enclosed by a water-cooled steel or glass envelope 7. The guide nut is rotated by a d-c electric motor 8 over a belt drive and worm reduction gear 9 at a total transmission ratio of 1:100. The electric motor is turned off by the limit switches 10 at a distance of 1 - 1.5 cm between focusing plates and specimen holders. The vacuum

Card 2/5

system consists of a ВН-2(VN-2) forepump and a ВА-05-1 (VA-05-1) standard unit. The latter consists of an oil vapor diffusion pump of type Н5 (N5), a slider, and a chamber with ionization and thermocouple manometers. A vacuum of $1 \cdot 10^{-5}$ mm Hg at an evacuation rate of 3000 l/min may be attained in the system. A rectifier consisting of a step-up transformer and four КР-110 (KR-110) kenotrons connected in parallel, was used for feeding the anode grid. The rectifier guarantees semiperiod rectification with a voltage of 3.6 kv and a maximum current of approximately 350 ma. The above feeding system permits a continuous regulation of the metal temperature and the elimination of unexpected overcharges. For visual checking of the melting process, a lens was inserted into the glass envelope through which enlarged images of the cathode heated to 2000 - 2500°C, of the focusing screens, and the zone of the melted metal can be projected onto a screen. For the purpose of degassing the specimen before zone melting, the specimen is annealed in vacuo by means of an electron beam, 100 - 300°C below the melting point of the material. The melting conditions for some high-melting metals are given in a table. The new device was used for preparing

26392
S/032/61/027/008/017/020
B124/B215

Device for...

Nb, Mo, Ta, Re, and W single crystals whose properties demonstrate the great value of zone melting by electron bombardment in a high vacuum. There are 2 figures, 1 table, and 1 non-Soviet-bloc reference.

ASSOCIATION: Institut metallurgii Akademii nauk SSSR im. A. A. Baykova (Institute of Metallurgy of the Academy of Sciences imeni A. A. Baykov)

Table: Melting conditions for high-melting metals. Legend: (A) Metal; (B) diameter of rod, mm; (C) voltage, v; (D) current, ma; (E) niobium; (F) molybdenum; (G) tantalum; (H) rhenium; (I) tungsten.

A) Металл	B) Диаметр прутка мм	C) Напряжение в	D) Ток ма
E) Ниобий	4	1200	110
F) Молибден	2	1500	130
G) Тантал	2	1800	150
H) Рений	2,5	2300	160
I) Вольфрам	2	3000	180

Tab.

Card 4/5

SAVITSKIY, Ye.M.; TEREKHOVA, V.F.; NAUMKIN, O.P.

Ultralight lithium alloys. TSvet. met. 34 no.5:58-61 My '61.
(MIRA 14:5)
(Lithium-magnesium-aluminum alloys)

SAVITSKIY, Ye.M.; VLASOV, A.I.

Copper hardening by finely dispersed particles. TSvet. met. 34 no.12:77-81 D '61. (MIRA 14:12)

(Copper--Hardening)

29817
S/020/61/140/006/014/030
B104/B102

18.7500

AUTHORS: ~~Savitskiy, Ye. M.~~, Tylkina, M. A., Pekarev, A. I., Gavrilyuk, M. I., and Zabavnova, A. P.

TITLE: Recrystallization diagram of cast tungsten

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 140, no. 6, 1961, 1301 - 1303

TEXT: By x-ray diffraction studies, microscopic examinations, and hardness measurements (Vickers hardness, 10 kg load) the authors constructed a complete recrystallization diagram of cast tungsten (99.6 %). After casting the specimens were compressed (70 %) and annealed (1600°C). The material had a grain size of 40 - 50 μ. The specimens were compressed from 6 to 90 % with a hammer in a hydrogen atmosphere at 700 - 1100°C. These temperatures are just below the recrystallization temperature of tungsten. After this treatment specimens of each deformation degree were annealed in the range from 1000 to 2500°C at every 100°C for one hour (between 1400 and 1600°C at every 50°C). The specimens were electrolytically polished (10 % NaOH in water, 1.7 a/cm^2). The recrystallization

X

Card 1/~~4~~3

29817
S/020/61/140/006/014/030
B104/B102

diagram of deformed tungsten is shown in Fig. 1. At deformations between 30 and 90 %, recrystallization sets in at 1450°C. The recrystallization takes place between 1450 and 1600°C. At a temperature of 1700°C, the grains start growing. At 9 % deformation, recrystallization sets in at 1600°C. The critical degree of deformation shifts from 12 % deformation at an annealing temperature of 1600°C to 6 % deformation at an annealing temperature of 2100°C. The coarsest grains were obtained by annealing at 2500°C. With an increase of the degree of deformation from 30 to 90 % hardness increased from 380 kg/mm^2 to 440 kg/mm^2. When recrystallized grains appear, hardness drops to 360 kg/mm^2. The optimum annealing temperature of tungsten deformed by 50 - 90% was assumed to be between 1500 and 1600°C. A comparison with data on high-purity single crystals showed the strong influence of impurities on the recrystallization temperature. There are 1 figure and 4 references: 2 Soviet and 2 non-Soviet. The 2 references to English-language publications read as follows: E. L. Harmon, J. Metals, 12, no. 9 (1960); S. J. Noesen, I. R. Hughes, Trans. Met. Soc., AIME, 218 (1960).

X

ASSOCIATION: Institut metallurgii im. A. A. Baykova Akademii nauk SSSR (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

Card 2/4 3

29817
S/020/61/140/006/014/030
B104/B102

Recrystallization diagram of cast ...

PRESENTED: June 2, 1961, by I. V. Tananayev, Academician

SUBMITTED: May 31, 1961

Fig. 1. Recrystallization diagram of commercial cast tungsten. Legend: (1) degree of deformation; (2) annealing temperature; (3) mean diameter of grains.

X

Card 3/~~4~~3

KAGANOVICH, Samuil Yakovlevich; VLASOV, K.A., glav. red.; SAVITSKIY, Ye.M., doktor khim. nauk, otv. red.; MERGASOV, G.G., red. izd-va; ZUDINA, V.I., tekhn. red.

[Zirconium and hafnium; technical and economic description and analysis of mineral resources, their development and use] TSirkonii i gafnii; tekhniko-ekonomicheskoe obobshchenie i analiz mineral'no-syr'evykh resursov, proizvodstva i primeneniia. Moskva, Izd-vo Akad. nauk SSSR, 1962. 180 p. (MIRA 16:1)

1. Chlen-korrespondent Akademii nauk SSSR (for Vlasov).
(Zirconium) (Hafnium)

SAVITSKIY, Yevgeniy Mikhaylovich, prof., doktor khim. nauk; TEREKHOVA, Vera Fedorovna; BUROV, Igor' Vladimirovich; MARKOVA, Inessa Aleksandrovna; NAUMKIN, Oleg Pankrat'yevich; MUKHIN, G.G., red.izd-va; GUSEVA, A.P., tekhn. red.

[Rare-earth metal alloys]Splavy redkozemel'nykh metallov. Moskva, Izd-vo Akad. nauk SSSR, 1962. 266 p. (MIRA 15:12)

1. Laboratoriya redkikh metallov i splavov Instituta metallurgii im.A.A.Baykova (for all except Mukhin, Guseva).
(Rare earth metals)

VOL, Abram Yevgen'yevich; AGEYEV, N.V., red.; ABRIKOSOV, N.Kh., doktor khim.nauk, red.; KORNILOV, I.I., doktor khim.nauk, red.; SAVITSKIY, Ye.M., doktor khim.nauk, red.; OSIPOV, K.A., doktor tekhn.nauk, red.; GUSEVA, L.N., kand.khim.nauk, red.; MIRGALOVSKAYA, M.S., kand.khim.nauk, red.; SHKLOVSKAYA, I.Yu., red.; MURASHOVA, N.Ya., tekhn.red.

[Structure and properties of binary metallic systems] Stroenie i svoistva dvoinykh metallicheskikh sistem. Pod rukovodstvom N.V. Ageeva. Moskva, Fizmatgiz. Vol.2. [Systems of vanadium, bismuth, hydrogen, tungsten, gadolinium, gallium, hafnium, germanium, holmium, dysprosium, europium, iron] Sistemy vanadiia, vismuta, vodoroda, vol'frama, gadoliniia, galliia, gafniia, germaniia, gol'miia, disproziia, evropiia, zheleza. 1962. 982 p. (MIRA 15:5)

1. Chlen-korrespondent AN SSSR (for Ageyev).
(Alloys) (Systems (Chemistry)) (Phase rule and equilibrium)

SAVITSKIY, YE. M.

The Second All-Union Conference on Rhenium, sponsored by the Institute of Metallurgy imeni A. A. Baykov, Academy of Sciences USSR, and the State Institute of Rare Metals, was held in Moscow 19-21 November 1962. A total of 335 representatives from 83 scientific institutions and industrial establishments participated. Among the reports presented were the following: autoclave extraction of Re from Cu concentrates (A. P. Zelikman and A. A. Perederyev); Re extraction from the gaseous phase (V. P. Savrayev and N. L. Peysakhov); recovery of Re by sorption and ion interchange (V. I. Bibikova, V. V. Il'ichenko, K. B. Lebedev, G. Sh. Tyurekhodzhayeva, V. V. Yermilov, Ye. S. Raimbekov, and M. I. Filimonov); production of carbonyl Re (A. A. Ginzburg); electrolytic production of high-purity Re and electroplating with Re (Z. M. Sominskaya and A. A. Nikitina); Re coatings on refractory metals produced by thermal dissociation of Re chlorides (A. N. Zelikman and N. V. Baryshnikov); plastic deformation and thermomechanical treatment of Re (V. I. Karavaytsev and Yu. A. Sokolov); growth of Re single crystals and effect of O_2 on their properties (Ye. M. Savitskiy and G. Ye. Chuprikov); Re-Mo, Re-W, and Re—precious-metal alloys (Ye. M. Savitskiy, M. A. Tylkina, and K. B. Povarova); synthesis of Re nitrides, silicides, phosphides, and selenides (G. V. Samsonov, V. A. Obolonchik, and V. S. Neshpor); weldability of Re-Mo and Re-W alloys (V. V. D'yachenko, B. P. Morozov, and G. N. Klebanov); new fields of application for Re and Re alloys (M. A. Tylkina and Ye. M. Savitskiy); and Re-Mo alloy for thermocouples (S. K. Danishevskiy, Yu. A. Kocherzhinskiy, and G. B. Lapp). [WW]

Tsvetnyye metally, no. 4, Apr 1963, pp 92-93

35777
S/180/62/000/001/013/014
E040/E135

18.1147

AUTHORS: Savitskiy, Ye.M., Baron, V.V., and T'Ao Tsu-Tsung (Moscow)

TITLE: Effect of rare earth metals on the ductility of cast molybdenum

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo. no.1, 1962, 156-159 + 1 plate

TEXT: The effect is examined of individual rare earth metals on the ductility of cast molybdenum. As starting materials were used technically-pure molybdenum (99.9% pure), Mischmetall, lanthanum, praseodymium, neodymium, gadolinium and ittrium, the addition range being of 0.2-5% by weight. Test alloys (60 g) were prepared in an arc-furnace with a non-consumable electrode, in the atmosphere of helium under a pressure of 250 mm Hg. In order to ensure homogeneous composition, each test alloy was re-melted three times. The specimens were vacuum-annealed at 1450 °C for one hour, after

Card 1/4

S/180/62/000/001/013/014
E040/E135

Effect of rare earth metals on ...

which they were subjected to chemical analysis, examined microscopically, tested for hardness and investigated with regard to the transition temperature into the brittle state. According to chemical analysis, 80 to 90% of the rare-earth metals added to the initial charge are lost through evaporation. Microscopic examination revealed that the grain size of cast Mo is not affected by the addition of rare-earth metals. Test results are reported in detail and show that small additions of Mischmetall, lanthanum and cerium ($<$ 0.15%) lower the Vickers hardness of cast molybdenum from 175 to 150 kg/mm^2. At comparatively high additions ($>$ 0.15%) of the rare earth metals, traces were observed of a second phase but no reduction in the hardness of molybdenum. The transition temperature into the brittle state in cast molybdenum was found to drop sharply at low additions of Mischmetall, lanthanum and cerium, but this trend was reversed when the quantity of the addition was increased (more than 0.15%). The highest improvement in the ductility of molybdenum was achieved by the addition of lanthanum. The transition temperature of Mo - 0.1% La alloy is close to room

Card 2/4

S/180/62/000/001/013/014
Effect of rare earth metals on ... E040/E135

temperature, i.e. it is about 500 °C lower than that of commercially-pure molybdenum. The transition temperature of Mo alloy with 0.01-0.03% Nd or Pr is below room temperature. However, with 0.07% Pr, the transition temperature rises to 420 °C; this is explained by the appearance of the second phase. The transition temperature of Mo-0.01% Gd alloy is 130 °C, rising to over 600 °C with an increase of Gd content to 0.15%. Similarly, small additions of Y lower the hardness and transition temperature of cast Mo, although to a lesser degree than other rare-earth metals. The transition temperature of Mo-0.15% Y alloy is above 600 °C. The effect of small additions of praseodymium on the hardness and transition temperature of cast molybdenum is analogous to those of Mischmetall, lanthanum and cerium additions. The praseodymium and neodymium concentrations in the alloys possessing the lowest transition temperature into the brittle state are lower than the corresponding contents of the other rare-earth metals here examined. The authors conclude that small additions of Mischmetall, lanthanum, cerium, praseodymium and neodymium lower the hardness and especially the

Card 3/4

S/180/62/000/001/013/014
E040/E135

Effect of rare earth metals on ...

ductile-to-brittle transition temperature of technically-pure cast molybdenum. This effect is ascribed to a refining action of rare earth metals on the penetration type (interstitial) impurities in molybdenum in consequence of a high chemical reactivity of rare earths. The appearance in the alloys of a second phase leads to a reverse effect, i.e. the transition temperature is increased. The addition of 0.08% La, 0.01% Nd and 0.03% Pr to cast molybdenum was found to have the greatest beneficial effect on its ductility and reduces its transition temperature by about 500 °C. Attempts to cold-roll specimens of this molybdenum failed, however. The solubility of rare-earth metals in molybdenum was found not to exceed 0.1%. There are 5 figures and 1 table.

SUBMITTED: July 2, 1961

X

Card 4/4

37733

S/180/62/000/002/012/018
E040/E535

18.1152

AUTHORS: Savitskiy, Ye.M., Baron, V.V. and Ivanova, K.N. (Moscow)

TITLE: Melting diagram and some properties of niobium-molybdenum-tungsten alloys

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no.2, 1962, 119-125

TEXT: In spite of the fact that the structure and properties of the ternary Nb-W-Mo alloys are of a considerable practical interest because of the good refractory characteristics of the constituent elements, practically no studies have been made in this field, with the exception of investigations of the phase equilibrium composition diagrams of the binary alloy systems involving the same three elements. The purpose of the present investigation was therefore to construct the phase equilibrium diagram of the Nb-Mo-W system and to examine the properties of some of its alloys. As the starting materials Nb (99.5% pure), Mo (99.99% pure) and tungsten (99.9% pure) were used. The test alloys were prepared by the arc-melting technique in a furnace

Card 1/4

with a non-consumable tungsten electrode in an atmosphere of purified helium under a pressure of 400 mm Hg. To ensure equilibrium conditions, the test alloys were re-melted four to five times. The composition of the test alloys was controlled by weighing, and chemical analysis was resorted to only if the difference in the weight of the specimens differed by more than 0.4-0.6% from the weight calculated for the required compositions. The cast specimens were homogenization annealed at 1000°C for 500 hours in evacuated quartz ampoules. The etchants used were the same as for pure metals except that the concentration was adjusted to suit the test alloy examined. Niobium was etched with a mixture of hydrofluoric and nitric acids, molybdenum with a mixture of sulphuric and nitric acids and tungsten by means of a mixture consisting of potassium ferrocyanide, caustic soda and water. Lattice parameters of crystals of the ternary solid solutions were determined by means of X-ray analysis on specimens annealed at 1000°C for 2000 hours and quenched from the same temperature. Measurement of hardness at room and elevated temperatures (1000°C), as well as microstructural analysis, were carried out on specimens of alloys from the Nb-Mo-W corner with constant molybdenum concentrations of 5, 10, 20, 30, 40, 60 and 75 weight %. In the cast state, the alloys had the characteristic dendritic structure of solid solutions; in the annealed state they were single-phase. No new phases were observed after annealing. On the basis of microstructural analysis of the 'as cast' and annealed specimens, determination of the melting points and X-ray examination data, the melting diagram was constructed of the Nb-Mo-W system. The existence was established of an unlimited solubility of the components of the system in the liquid and solid states. Isotherms of the solidus alloys showed that the melting temperature drops from 3200°C to 2400°C with decreasing tungsten concentration in the alloys. In the concentration range investigated, the alloys containing about 70-90% Nb (remainder Mo and W) were found to have the lowest drop in strength at 1000°C. The highest resistance to oxidation was found in binary niobium-base alloys with 10-15% Mo and 15-30% W (by weight). The highest resistance to oxidation among the ternary alloys was shown by niobium-base alloys containing not more than 20 wt.% W and 10 wt.% Mo. Consequently, the most promising and most refractory alloys for service in the temperature range up to 3200°C are the alloys in the niobium corner of the Nb-Mo-W ternary system. There are 6 figures.

SUBMITTED: May 27, 1961

S/030/62/000/003/002/007
B139/B104

AUTHOR: Savitskiy, Ye. M., Professor

TITLE: Modern physics of metals and new technological problems

PERIODICAL: Akademiya nauk SSSR. Vestnik, no. 3, 1962, 24 - 34

TEXT: Phase diagrams are a most important chapter in the development of new metal alloys. According to N. V. Ageyev, the chemical properties of the elements concerned are decisive factors in their production. The physical properties of metal crystals are mainly determined by the type of atomic bond which is not directly measurable yet. New phases may arise when freezing liquid metal mixtures, either "solid solutions" with atomic bond of a metallic character, or "metal compounds" with crystalline structure and mixed atomic bond. Commercial alloys are mostly solid solutions as to their structure. According to S. T. Konobeyevskiy, the solid solution boundary corresponds to the minimum of the thermodynamic potential and the critical electron concentration. "Metallic compounds", first so designated by N. S. Kurnakov, are usable in the construction of reactors, rocket propulsion units, and electronic instruments. The relation-
Card 1/2

S/030/62/000/003/002/007
B139/B104

Modern physics of metals and ...

ship between the physical properties and the crystalline structure is still little investigated in the USSR. Crystal interfaces are currently regarded as transition zones at which the crystallites unite to form a polycrystalline body. Methods of determining the gas content in metals have been developed. The influence of metalloids upon metal properties has been recognized and put to use. The initial material has to be as pure as possible, and the gases are fed in doses of hundredths and thousandths per cent. The pure initial material is obtained by forging or rolling in vacuum or protective gas. Current investigations include the electron bombardment of metal lattices (100,000 km/hr). A multipurpose device, serving for annealing samples in vacuum, for observing and taking pictures of the microstructure of heated samples, and for determining the beginning of flow in high-melting alloys, is now in operation at the Institut metallurgii im. A. A. Baykova (Institute of Metallurgy imeni A. A. Baykov). The same institute is also operating a plant for the production of single crystals of any high-melting metal by electron bombardment. Impurities have been reduced to millionths per cent, and new properties of the said metals have been discovered. There are 4 figures.

Card 2/2

TYLKINA, M.A.(Moskva); POVAROVA, K.B.(Moskva); SAVITSKIY, Ye.M.(Moskva)

Recrystallization and mechanical properties of alloys in the system tungsten - molybdenum - rhenium. Izv. AN SSSR.Otd.tekh.nauk. Met. i topl.181-186 S-O '62. (MIRA 15:10)
(Tungsten-molybdenum-rhenium alloys—Testing)
(Crystallization)

S/180/62/000/003/015/016
E193/E192

AUTHORS: Savitskiy, Ye.M., Baron, V.V., and Yefimov, Yu.V.
(Moscow)

TITLE: The effect of cerium on plasticity of vanadium

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no.3, 1962, 107-113

TEXT: The object of the present investigation was to explore the possibilities of achieving the removal of N, O and S from vanadium and thereby improving its placticity, by addition of cerium to vanadium melts. Both alumino- and carbo-thermic vanadium was used in the preparation of experimental samples (10-15 g in weight), which were melted in a tungsten arc furnace with water-cooled copper hearth in an atmosphere of pure helium at 0.9 atm. The proportion of cerium added varied from 0.2 to 50% wt. Each sample was remelted four times to ensure homogeneity of the metal. The buttons obtained in this manner were mechanically descaled and the vanadium-rich layer, separated

Card 1/4 3

from the cerium layer, was used to conduct chemical and gas analyses, metallographic examination, hardness measurements, compression tests and cold rolling tests. The conclusions were as follows. 1) Cerium has limited solubility in both solid and liquid vanadium. The liquid miscibility gap begins at 0.2-0.3 % wt. Ce, and the solid solubility of Ce in V is less than 0.1 % wt. 2) Addition of Ce to V melts brings about a considerable decrease in its oxygen, nitrogen and sulphur content and causes a corresponding improvement in its plastic properties. This is demonstrated in Table 3, where some data for Ce-treated carbo-thermic vanadium are given. It should be pointed out that complete purification of the melt cannot be achieved in one operation since a state of equilibrium is reached between liquid vanadium, cerium, and the slag; further decrease in the oxygen content in vanadium can be attained only by repeated removal of slag and addition of cerium until the required degree of purity of the melt is attained. Sample melt in Table 3 underwent five such operations. 3) The carbon and metallic impurities content in vanadium is not affected by Ce additions. 4) When large Ce

additions are required to purify heavily contaminated vanadium, difficulties may arise in melting the charge, owing to the formation of a thick layer of (mainly CeO_2) slag which either weakens, or even breaks, the arc, particularly when large (500-600 g) batches of vanadium are treated.
There are 3 figures and 6 tables.

SUBMITTED: September 18, 1961

SAVITSKIY, Ye.M. (Moskva); TAO TSZU-TSUN [T'ao TSu-ts'ung] (Moskva)

Mechanical properties and recrystallization temperature of single crystals of molybdenum. Izv.AN SSSR. Otd.tekh.nauk Met.i topl. no.4:133-136 Jl-Ag '62. (MIRA 15:8)

1. Institut metallurgii im. A.A.Baykova.
(Molybdenum) (Crystallization)

~~SAVITSKIY~~, Ye.M. (Moskva); CHUPRIKOV, G.Ye. (Moskva)

Effect of oxygen on the mechanical and electrical properties of metallic rhenium. Izv.AN SSSR. Otd.tekh.nauk. Met.i topl. no.4: 137-142 Jl-Ag '62. (MIRA 15:8)

(Rhenium--Metallography)

S/180/62/000/004/008/009
E111/E183

AUTHORS: Savitskiy, Ye.M., and Kopetskiy, Ch.V. (Moscow)

TITLE: Solubility of chemical elements in manganese

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no.4, 1962, 157-161

TEXT: An attempt was made to use the established general principles of the formation of metallic substitutional solid solutions to estimate the solubility of various elements in allotropic modifications of manganese. It was shown that solid solubility is satisfactorily defined by three factors: size (atomic radii), chemical and crystallographic. Of 21 elements for which the dimensional factor is favourable and which are electro-negative with respect to gamma-manganese, 17 form regions of limited solid solutions with over 5 atomic %, and only 4 have a low solubility (under 1-2 atomic %). The chemical factor is most conveniently expressed through the difference in electro-negativity. For gamma manganese a continuous range of

Card 1/2

substitutional solid solutions is formed if the size factor

$$p = \frac{R_A - R_B}{R_B} \cdot 100\%$$

is between 0 and -5% (where R_A and R_B are the atomic radii of the solute and manganese, respectively), if the difference between the electronegativity of manganese and the solute is between 0.1 and 0, and if the crystal lattices correspond. Rather similar relationships hold for beta-manganese, but not for the alpha modification, probably because of its complicated structure. It is concluded that the method studied is suitable for estimating the solubility of various elements in metals.
There are 2 figures.

SUBMITTED: January 19, 1962

S/031/62/000/005/002/002
B144/B138

AUTHORS: Savitskiy, Ye. M., Doctor of Chemical Sciences, Duysemaliyev, U. K.

TITLE: Cu-corner of the constitution diagram of the copper-vanadium system

PERIODICAL: Akademiya nauk Kazakhskoy SSR. Vestnik, no. 5, 1962, 55 - 60

TEXT: Microstructure, thermal, and x-ray diffraction analyses and data on hardness, microhardness, and resistivity of Cu-V alloys are used to construct the Cu corner of the constitution diagram of the Cu-V system for which reliable data were still lacking. The alloy consisting of V (containing 0.25 % C, 0.02 % N_2, 0.0228 % O_2, and up to 0.2 % metal impurities) and electrolytic Cu (containing up to 0.05 % overall impurities) is melted in a corundum crucible in a high-frequency oven in Ar atmosphere. A bottom layer of V is covered with Cu purified from oxides. Uniform V distribution is obtained by remelting; then the samples are forged and annealed at 900°C for 50 - 100 hrs and their microsection surface etched with HNO_3. Microscopic analysis reveals lamination in the liquid state

Card 1/2

S/031/62/000/005/002/002
B144/B138

Cu-corner of the constitution diagram ...

in the 3 - 10 % V range and a very inhomogeneous V distribution. With less than 3 % V lamination is not observed. X-ray analysis shows that the matrix is a solid solution of 0.32 - 0.04 % by weight V in Cu, while the inclusions are a solid solution of Cu in V containing 3.3 - 0.4 Cu. The solubility of V in Cu in solid state at different temperatures is determined by hardening and increases with rising temperatures; the interaction in the Cu-corner is peritectic. The temperature of the peritectic reaction is measured by differential thermal microanalysis. Additions of V up to 0.64 % by weight increase the temperature of initial fusion from 1083 to 1120°C and the microhardness from 98 to 104 kg/mm^2. Further addition has no effect. The Brinell hardness increases gradually with the V content. The resistivity is hardly influenced at all. X-ray diffraction analysis detects 2 solid solutions in the alloys: a solid α-solution rich in Cu with a face-centered cubic lattice and a solid β-solution rich in V with a body-centered cubic lattice. Introduction of V into the solid solution results in a slight increase of the Cu lattice parameter. There are 4 figures and 3 tables.

Card 2/2

S/129/62/000/006/002/008
E193/E483

AUTHORS: ~~Savitskiy, Ye.M.~~, Doctor of Chemical Sciences, Professor, Sol'ts, V.A., Engineer, Tylkina, M.A., Candidate of Technical Sciences

TITLE: The effect of rhenium on the properties of a cobalt-chromium-nickel alloy

PERIODICAL: Metallovedeniye i termicheskaya obrabotka metallov, no.6, 1962, 10-13 + 1 plate

TEXT: The Co-Cr-Ni alloy К40НХМ (K40NKhM) is used as a material for those parts of electrical measuring instruments which must be anti-magnetic and have high hardness and good corrosion and wear resistance. In some cases, hardness higher than that obtained by mechanical and thermal treatment is required and the object of the present investigation was to explore the possibility of achieving this end by alloying with rhenium. The experimental materials were prepared by remelting rods of the K40NKhN alloy with 0.5 to 15% rhenium introduced in the form of sintered powder briquettes. The ingots, 10 to 12 mm diameter, were reduced by

Card 1/3

S/129/62/000/006/002/008
E193/F483

The effect of rhenium ...

hot swaging at 1150 - 1180°C to 4.5 - 5.5 mm diameter, and then drawn to 0.5 mm diameter wire in several operations with intermediate annealings, the reduction given in the final operation varying between 50 and 80%. Metallographic examination revealed that the alloy studied could contain up to 10% rhenium in solid solution. All cast alloys had a similar dendritic structure; after hot swaging the rhenium-free specimens consisted of large polyhedral grains with disperse inclusions of a second phase particle. Addition of rhenium brought about considerable grain refinement and formation of twins in swaged specimens, the latter effect being particularly pronounced in alloys with 7 to 10% rhenium. All specimens were solution treated at 1180°C and then aged at various temperatures, hardness measurements being taken on each specimen in various stages of the mechanical and thermal treatment. Typical results are reproduced in Fig.2, 3 and 6. In Fig.2, Rockwell hardness (HRB and HRC) is plotted against the rhenium content in the alloys, graphs a, б and в relating to cast, hot-swaged and solution treated material, respectively. In Fig.3, hardness (Rockwell HRC and Vickers HV)

Card 2/5

of wire specimens, given 80% cold deformation, solution treated and then aged, is plotted against the ageing temperature; various curves relating to specimens with no rhenium (curve 1) and to specimens containing 0.5, 0.8, 3.0, 5.0, 7.0 and 10.0% rhenium (curves 2, 3, 6, 7, 8 and 9 respectively). Finally, hardness (HRC and HV) of aged specimens containing 7% rhenium is plotted against the ageing temperature, various curves relating to wires which in the last drawing operation had been given different reductions, as indicated by each curve. Several conclusions were reached. 1. Addition of rhenium increases the strength of the K40NKhM alloy without reducing its workability or affecting its anti-magnetic and corrosion-resistance properties. 2. Hardness of 60 to 64 HRC and UTS of 260 to 280 kg/mm^2 can be attained in an aged alloy containing 7 to 10% rhenium. There are 6 figures.

ASSOCIATION: TsNIIChM
Institut metallurgii im. A.A.Baykova (Institute of Metallurgy imeni A.A.Baykov)

S/180/62/000/006/019/022
E193/E383

AUTHORS: Savitskiy, Ye.M. and Chuprikov, G.Ye. (Moscow)

TITLE: The mechanism of plastic deformation of rhenium of various degrees of purity

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Otdeleniye tekhnicheskikh nauk. Metallurgiya i toplivo, no. 6, 1962, 167 - 170

TEXT: The object of the present investigation was to study the effect of the oxygen content on the mode of deformation of rhenium single crystals tested in tension at room temperature. The oxygen content in the test pieces (2 mm in diameter, 14 mm gauge length) was 0.002 and 0.006 wt.%. The experiments consisted of determining the orientation of each crystal by X-ray diffraction measurements, extending it at a strain rate of 0.5 mm/min to 2% elongation and examining under a microscope the slip lines formed on the surface of each test piece. In the case of the specimen containing 0.002% O, loaded in the direction intermediate between the $(10\bar{1}0)$ and (0001) directions, slip on the $(10\bar{1}0)$ plane occurred first. All other conditions being equal, increasing the

Card 1/2

S/180/62/000/006/019/022
The mechanism of E193/E383

concentration of oxygen to 0.006% brought about the appearance of two systems of slip: slip on the (10$\bar{1}$0) plane and slip on the basal plane (0001) in the (1120) direction. The results obtained confirmed the findings of Geech, Geoffrey and Smith (Probl. sovrem. metallurgii, 1960, no. 5, 139) who had concluded that the existence of three systems of slip in rhenium was caused by high concentration of the interstitial atoms.

SUBMITTED: July 2, 1962

Card 2/2

D'YACHENKO, V.V., kand.tekhn.nauk; MOROZOV, B.P., inzh.; TYLKINA, M.A., kand.tekhn.nauk; SAVITSKIY, Ye.M., doktor khim.nauk; Prinimali uchastiye: VINOKUROV, V.P.; BIRYUKOVA, L.V.

Welding molybdenum with an addition alloying of the weld metal by rhenium. Svar.proizv. no.7:1-4 Jl '62. (MIRA 15:12)

1. Moskovskiy aviatsionnyy tekhnologicheskiy institut (for D'yachenko, Morozov). 2. Institut metallurgii im. A.A.Baykova (for Tylkina, Savitskiy).

(Molybdenum—Welding) (Rhenium)

S/598/62/000/007/005/040
D267/D307

AUTHORS: Savitskiy, Ye. M. and Burkhanov, G. S.

TITLE: Phase diagrams of alloys of titanium with rare-earth metals

SOURCE: Akademiya nauk SSSR. Institut metallurgii. Titan i yego splavy. no. 7, Moscow, 1962. Metallokhimiya i novyye splavy, 51-60

TEXT: In view of the fact that the addition of Y and Sc has a favorable effect on the physico-chemical and mechanical properties of various alloys, an investigation was carried out of the physico-chemical interaction between La, Ce, Nd, Y and Sc on the one hand, and Ti and some Ti alloys on the other, the microscopic, thermal and X-ray analysis being used. It was found that in binary alloys the rare-earth metals slightly raise the temperature of the polymorphous transformation of Ti, no intermetallic compounds being formed with Ti. The solubility of Y and Sc in Ti depends noticeably on the atomic radius of the rare-earth metal. The lowest ab-

Card 1/2

solute solubility in Ti was observed for Ce, the highest for Sc. The most favorable effect on mechanical properties at elevated temperatures was found in the case of rare-earth metals with even atomic numbers. The temperature of polymorphous transformation of Sc (1450°C) is lowered to 1350°C by additions of Ti. The solubility of La and Ce in Ti is considerably reduced when Al and V are present in the alloy. The structure of Ti and its alloys is modified by the addition of rare-earth metals. There are 9 figures and 1 table.

SAVITSKIY, Ye.M., doktor khim.nauk, prof.; TEREKHOVA, V.F., kand.tekhn.nauk;
MARKOVA, I.A., inzh.; FILIMONOVA, R.F., inzh.

Interaction of yttrium with other metals. Metalloved. i term. obr.
met. no.9:42-49 S '62. (MIRA 16:5)

1. Institut metallurgii imeni A.A.Baykova.
(Yttrium alloys—Metallography) (Phase rule and equilibrium)

40990

S/659/62/009/000/027/030
I003/I203

18.1152

AUTHORS Savitskiy, Ye. M., Tylkina, M. A., Zhdanova, L. L., Zubkova, L. A., Starkov, V. N., Fokin, A. G., Petrova, L. S., and Arkusha, T. I.

TITLE The properties of rhenium, rhenium-tungsten and rhenium-molybdenum alloys

SOURCE Akademiya nauk SSSR. Institut metallurgii. Issledovaniya po zharoprochnym splavam. v. 9. 1962. Materialy Nauchnoy sessii po zharoprochnym splavam (1961 g.), 194–203

TEXT Modern technology demands the most refractory metals such as W, Re, Ta and Mo. In the present work the microstructure and the mechanical properties of Re—W and Re—Mo were investigated at room and at 2600°–3400°C. Methods of casting and of plastic deformation of W—Re, Mo—Re and W—Mo—Re alloys were developed. It was shown that when tungsten and molybdenum are alloyed with rhenium there is an increase in plasticity in machinability in weldability and in strength, and the temperature of recrystallization increases by 400–500°C. There are 4 figures and 1 table.

Card 1/1

S/078/62/007/002/017/019
B127/B110

AUTHORS: Savitskiy, Ye. M., Tylkina, M. A., Polyakova, V. P.

TITLE: Phase diagram of the ruthenium - rhenium melt

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 2, 1962, 439 - 441

TEXT: The existence of a continuous series of solid solutions in all concentrations is assumed on the basis of the vicinity of Ru and Re in the periodic system, the similarity of their radii, and isomorphy of the crystal structure. This assumption was confirmed by experiments. Various specimens, cast and thermally treated, were used for the phase analysis. V. S. Shekhtman used cuts for an X-ray diffraction analysis in a РКУ (RKU) chamber by Cu-Kα radiation. This analysis showed the solid solutions to be of hexagonal structure. There are 2 figures, 1 table, and 1 Soviet reference.

SUBMITTED: June 23, 1961

Fig. 1. (a) Phase diagram Ru - Re; (б) dependence of the lattice co ant

Card 1/2

34870
S/078/62/007/003/017/019
B110/B138

18.1285

AUTHORS: Savitskiy, Ye. M., Burkhanov, G. S.

TITLE: Constitution diagram of the titanium - gadolinium system

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 3, 1962, 699 - 701

TEXT: The constitution diagram of Ti-Gd melts was examined. The following Ti-Gd alloys were produced in the electric-arc furnace with a W electrode in He atmosphere: Ti; Ti + 0.5% of Gd; Ti + 1% of Gd; Ti - 1.5% of Gd; Ti - 2% of Gd; Ti - 3% of Gd; Ti - 4% of Gd; Ti - 5% of Gd; Ti - 10% of Gd; Ti - 20% of Gd; Ti - 40% of Gd; Ti - 60% of Gd; Ti - 80% of Gd; Ti - 90% of Gd; Ti - 99.7% of Gd. Pre-deformed alloys were annealed for 100 hrs at 1000°C. The constitution diagram (Fig.) was based on thermal, X-ray diffraction and microscopic analyses, and on hardness tests. Ti-Gd alloys crystallize as eutectics (crystallization of the eutectic at 1120°C). Gd has practically no influence on the polymorphous transformation of Ti, and Ti probably lowers the transformation point of Gd. In the two-phase range up to 880°C, the alloys consist of solid solutions of Gd in α-Ti and Ti in α-Gd. The solubility of Gd in α-Ti is 1% by weight at 600°C, and 3% by weight at 850°C. Ti is only very slightly soluble in Gd (less than 0.3%

Card 1/3

S/078/62/007/003/017/019
B110/B138

Constitution diagram of the...

by weight). The hardness of the alloys increases in the solid solutions range; in the two-phase range the hardness varies additively. There are 1 figure and 13 references: 11 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: R. H. Hiltz, N. J. Grant. J. Metals, 9, 41 (1957); K. A. Gschneidner. Tr. Los Alamos Scientific Laboratory Los Alamos, New Mexico, February, 1959. A compilation of the physical properties of the rare earth, scandium and yttrium metals.

ASSOCIATION: Institut metallurgii Akademii nauk SSSR im. A. A. Baykova (Institute of Metallurgy imeni A. A. Baykov of the Academy of Sciences USSR)

SUBMITTED: September 20, 1961

15372

S/078/62/007/003/018/019
B110/B138

18.1200

AUTHORS: Savitskiy, Ye. M., Baron, V. V., Yefimov, Yu. V.

TITLE: Constitution diagram of the vanadium - cerium system

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 3, 1962, 701 - 703

TEXT: The constitution diagram of the vanadium - cerium system with up to 50% by weight cerium was investigated by macrostructural, microstructural, thermal, and X-ray diffraction analyses, and by microhardness tests. Carbothermic V (99.766%) and metallic cerium (98.8%) were fused in an electric arc furnace in He atmosphere at 0.9 atm. Alloys with up to 1% by weight of cerium were annealed for 100 hrs at 1100°C, and those with higher Ce content for 200 - 250 hrs at 750°C. A second cerium-rich layer appeared at 0.2 - 0.3% of Ce. The vanadium-rich layers were single-phase. Ce was only slightly soluble in V (maximum 0.1%) and independent of temperature. Measured on a ПМТ-3 (PMT-3) apparatus at 100 g microhardness increased from 150 to 165-170 kg/mm^2 when 0.05 - 0.1% Ce was added. Using the drop method of measuring melting point (Izv. AN SSSR, Otd. tekhn. n., no. 4, 36 (1958)) the monotectic equilibrium point was found to be

Card 1/2

close to the melting point of V (1885 ± 15°C). V raises the melting point of Ce by only 5 - 7°C, apparently forming a peritectic, and lowers the temperature of the polymorphous $\gamma \rightarrow \delta$ Ce transformation by 20-25°C. The fusion of commercial V, containing O_2 and N_2 impurities, with Ce reduces hardness and increases ductility in the cold state by reducing the O_2 and N_2. Ce-refined V can be cold-rolled up to 95% deformation. There are 2 figures and 4 references: 3 Soviet and 1 non-Soviet. The reference to the English-language publication reads as follows: S. A. Komjathy, R. H. Read, W. Rostoker. Phase relationships in selected binary and ternary Vanadium - base alloys systems. Armour Research Foundation of Illinois Institute of Technology. Wadc Technical Report 59 - 483, p. 6 - 15, January 1960.

SUBMITTED: September 16, 1961

37171

S/078/62/007/005/011/014
B101/B110

18.9200

AUTHORS: ~~Savitskiy, Ye. M.,~~ Baron, V. V., Yefimov, Yu. V., Gladyshevskiy, Ye. I.

TITLE: Investigation of the system vanadium - molybdenum - silicon

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 5, 1962, 1117-1125

TEXT: The ternary phase diagram of the system V - Mo - Si was plotted by means of x-ray analysis, microstructural analysis, and microhardness measurement (Fig.9). Results: (1) No new ternary compounds are formed with a structure deviating from that of binary V and Mo silicides. (2) Between the isostructural compounds V_3Si and Mo_3Si, as well as V_5Si_3 and Mo_5Si_3, continuous series of solid solutions are formed in which the Si content varies by 1 to 2%. The range of the homogeneous ternary solid solution $(V,Mo)_5Si_3$ extends above 1500°C toward higher Si contents. (3) The ternary eutectic $(V,Mo)_5Si_3$ - $(Mo,V)Si_2$ - $(V,Mo)Si_2$

Card 1/3

forms at 1600°C. At 800°C, the solubility of V in $MoSi_2$ is below 1 at%. (4) The phase $(V,Mo)_5Si_3$ melts congruently, the phase $(V,Mo)_3Si$ forms by peritectic reaction. (5) The unlimited solubility of Mo in V is much reduced by introduction of Si. With about 2 at% Si in V-Mo alloys rich in V, a solid solution on the basis of $(V,Mo)_3Si$ is observed as second phase. (6) Alloying with Si improves greatly the stability of V to oxidation, but reduces considerably its plasticity. With 0% Si, the plasticity on compression $\varepsilon = 30\%$; with 20 at% Mo + Si, $\varepsilon \sim 6\%$. There are 9 figures and 1 table.

ASSOCIATION: Institut metallurgii im. A. A. Baykova (Institute of Metallurgy imeni A. A. Baykov); L'vovskiy gosudarstvennyy universitet (L'vov State University)

SUBMITTED: June 12, 1961

Fig. 9. Isothermal section of the system V-Mo-Si at 800°C.
Legend: Am.% = at%.

S/078/62/007/005/011/014
B101/B110

Investigation of the system...

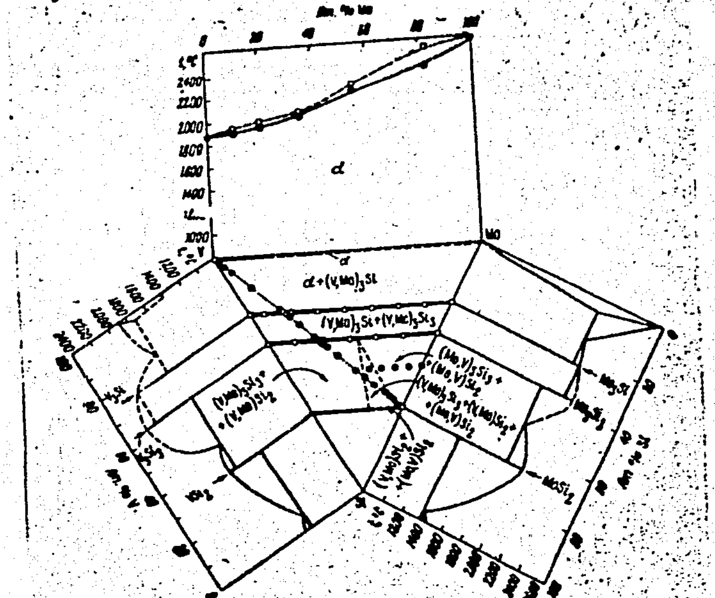


Fig. 9

Card 3/3

S/078/62/007/006/007/024
B124/B138

AUTHORS: Pravoverov, N. L., Savitskiy, Ye. M.

TITLE: Effect of alloying additions on the electric properties of the tensimetric palladium silver alloy ПдС-35 (PdS-35)

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 6, 1962, 1336-1342

TEXT: The change of electric resistivity with temperature was studied for alloys of Pd with 15, 30, 35, 40, 45, 50, 55, 60, and 85 at% Ag, as possible materials for resistance strain gages. The electric resistivity was measured with a potentiometer between 25 and 1000°C. It was found that the PdS-45 alloy with 45% Ag was best suited for this purpose (low temperature coefficient of the resistivity in a wide temperature range, minimum value of ~40 microohm·cm). The degree of oxidation between 25 and 800°C was much lower than with the PdS-35 alloy (containing 35% Ag). When a third component is introduced in the solid solution, the resistivity of the alloy increases owing to intercrystalline stresses caused by the difference in atomic diameters and the crystal lattice types. Experiments

Card 1/2

Effect of alloying additions on the ... S/078/62/007/006/007/024
B124/B138

with alloying additions consisting of metals of groups I-VI of the periodic system have shown that the high-melting transition metals Pt, Re, W, Ta, Mo, Zr, Ru, and, probably, osmium are promising (Fig. 4, Table). Optimum electric properties were attained with an alloy containing tungsten. There are 5 figures and 1 table. The two English-language references are: N. E. Mott, Proc. of Cambridge Phil. Soc. 32, 281 (1936); R. Hibbard, J. of Metals 6, 594 (1954).

SUBMITTED: July 11, 1961

Fig. 4. Effect of transition metal additions on the electric properties of PdS-35 alloy. (1) Specific resistivity, (2) ratio ρ_{400}/ρ_{25}, ρ_{400} denoting the resistivity at 400°C. Legend: (A) ρ_{25}, microohm·cm, (B) PdS-35.

Card 2/2

S/078/62/007/006/020/024
B110/B144

AUTHORS: Tylkina, M. A., Polyakova, V. P., Savitskiy, Ye. M.

TITLE: Phase diagram of osmium - ruthenium alloys

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 6, 1962, 1467 - 1468

TEXT: An Os - Ru phase diagram was established for the first time, by determining melting point and hardness and by microstructural and x-ray structural phase analyses. As Os and Ru have hexagonal crystal structures, and their atomic radii differ by no more than 1.51%, of solid solutions were assumed to form in an unbroken series. Os and Ru powders of 99.8% purity were pressed into tablets, sintered at 1200°C in vacuo, then melted in an evacuated electric arc furnace under a helium pressure of 200 - 250 mm Hg. Cast samples annealed at 2000°C for 1 hr and at 1000°C for 500 hrs were used for the phase analyses. Ground sections etched in 15% HNO_3 using alternating current were used for the micro-structural analysis. Lattice constants and hardness were determined under Cu-K_α radiation and under 5-kg load (in the Vickers test),

Card 1/2

respectively. Results: (1) Os and Ru form an unbroken series of solid solutions (by substitution). (2) The initial melting point of the alloys decreases continuously from Os to Ru. (3) All cast alloys show dendritic structures throughout their range of concentrations. The annealed alloys have the same polyhedral microstructure as the solid solutions. (4) The solid solutions of the alloys have hexagonal structures only. The lattice constants decrease continuously from Os to Ru. (5) Hardness shows a flattened maximum between 70 and 60% by weight of Os. There are 2 figures and 1 table.

SUBMITTED: January 11, 1962

S/078/62/007/006/021/024
B110/B144

AUTHORS: Tylkina, M. A., Polyakova, V. P., Savitskiy, Ye. M.

TITLE: Phase diagram of osmium-rhenium alloys

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 6, 1962, 1469-1470

TEXT: An Os-Re phase diagram was established for the first time, by measuring melting point and hardness and by microstructural and x-ray structural phase analyses. It was assumed that an unbroken series of solid solutions is formed by substitution as these metals belong among transition metals having incomplete d-shells, they adjoin one another in the periodic system, the have isomorphous crystal structures, and their atomic radii differ but little. Metals of 99.8 % purity were pressed, sintered, and melted in an electric arc furnace under a helium atmosphere at 200-250 mm Hg. Cast samples annealed at 2000°C for 1 hr and at 1000°C for 500 hrs were used for the analyses and measurements. Microsections etched in 15 % HNO_3 using alternating current were used for the microstructural analysis. Lattice constants and hardness were determined respectively under Cu-K_α radiation and under 5-kg load (in the Vickers test).

Card 1/2

Phase diagram of...

S/078/62/007/006/021/024
B110/B144

Results: (1) Os and Re form an unbroken series of solid solutions (by substitution). (2) The initial melting point of the alloys rises continuously from Os to Re. (3) All cast and annealed alloys exhibit polyhedral microstructures. (4) The solid solutions of the alloys have hexagonal structures only. The lattice constants increase continuously with the Re content. (5) The hardness of cast and annealed alloys shows a flattened maximum at 60-70 % Os. There are 2 figures and 1 table.

SUBMITTED: January 11, 1962

Card 2/2

S/078/62/007/006/022/024
B110/B144

AUTHORS: Tylkina, M. A., Polyakova, V. P., Savitskiy, Ye. M.

TITLE: Palladium-iridium phase diagram

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 6, 1962, 1471-1473

TEXT: The Pd-Ir phase diagram was established by measuring the melting point, the microhardness of the phases and the Brinell hardness, and by microstructural and x-ray phase analyses. Pd and Ir have face-centered cubic crystal structures and similar electronegativity (Ir: 2.10; Pd: 2.08); their atomic radii differ by not more than 1.5 %. Metal powders of 99.8 % purity were pressed, sintered in vacuo, and melted in an induction furnace - or, when containing 40-80 % by weight of Ir, in an electric arc furnace - under a helium atmosphere at 200-250 mm Hg. Heat treatment of the samples for the phase analysis: (1) All alloys were quenched from temperatures near their melting points. (2) Alloys containing 40-100 % Ir were quenched from 1600°C in vacuo. (3) All alloys were quenched from 1500°C in vacuo, from 1300°C, 1100°C, 900°C, and 700°C. (4) Annealing followed for 300 hrs at 1000°C, then cooling to 400°C at a

Card 1/3

Palladium-iridium phase diagram

S/078/62/007/006/022/024
B110/B144

rate of 100°C/24 hrs, and further cooling in the furnace. Cu-K_α radiation was used for the x-ray structural analyses. Sections of alloys rich in Pd, etched with an ethanol solution of Br, and sections of alloys rich in Ir, etched in 10 % HCl with alternating current, were used for the micro-structural analysis. The hardness and microhardness were determined under a 250-kg load in the Brinell press, and under 50-g and 20-g loads in the ПТМ-3 (PTM-3) device, respectively. Results: (1) A peritectic diagram ((liq + β ⇌ α) 1760 ± 25°C) with two bounded solid solutions was found. (2) The region of the solid α-solution of Ir in Pd decreases from 38 % by weight of Ir at ~1700°C to 5 % by weight at <700°C. (3) Alloys containing ≤ 30 % by weight Ir, quenched from 1500°C, have a single-phase polyhedral structure. (4) The melting point of the solid α-solution increases from that of Pd (1552°C) to 1620°C (30 % by weight of Ir). (5) The microhardness increases from 40 kg/mm² (pure Pd) to 200 kg/mm² (30 % by weight of Ir). The hardness of alloys with solid α-solution, quenched from 1500°C increases continuously from 35 kg/mm² (pure Pd) to 120 kg/mm² (30 % by weight of Ir). (6) The region of the solid β-solution decreases from 17 % by weight of Pd at ~1700°C to 9 % by weight of Pd at 1100°C. On quenching from < 1600°C, a second phase is separated, and the

Card 2/3

hardness of an alloy containing 10 % by weight of Pd increases. (7) Two face-centered cubic solid solutions occur in alloys containing 60 and 70 % by weight of Ir when quenched from temperatures near the melting point. There are 2 figures.

SUBMITTED: January 11, 1962

SAVITSKIY, Ye.M.; TYLKINA, M.A.; TSYGANOVA, I.A.; GLADYSHEVSKIY, Ye.I.; MULYAVA, M.P.

Phase diagram of the hafnium - rhenium system. Zhur.neorg.khim. 7 no.7: 1608-1610 Jl '62. (MIRA 16:3)

1. Institut metallurgii imeni A.A.Baykova i L'vovskiy gosudarstvennyy universitet imeni I.Franko.

(Hafnium-rhenium alloys)

TYLKINA, M.A.; TSYGANOVA, I.A.; SAVITSKIY, Ye.M.

Phase diagrams of rhenium alloys with platinum metals (rhocium, palladium, iridium). Zhur. neorg. khim. 7 no.8:1917-1927 Ag '62. (MIRA 16:6)

(Rhenium alloys) (Platinum metals)

SAVITSKIY, Ye.M.; TYLKINA, M.A.; CHUPRIKOV, G.Ye.

Effect of metallic impurities on the physicomechanical properties of rhenium. Zhur.neorg.khim. 7 no.9:2272-2274 S '62.

(MIRA 15:9)

(Rhenium) (Metals)

S/078/62/007/010/002/008
B144/B186

AUTHORS: Savitskiy, Ye. M., Terekhova, V. F., Birun, N. A.

TITLE: Phase diagram of the magnesium-palladium system

PERIODICAL: Zhurnal neorganicheskoy khimii, v. 7, no. 10, 1962, 2367-2373

TEXT: A complete phase diagram of the Mg - Pd system (Fig. 2) was established, based on thermal, microstructural and X-ray diffraction analyses and on the determination of specific weight, hardness, and microhardness. The specific weight of the alloys increases up to a Pd content of 50% by weight, at first slowly and then rapidly. The microstructural analysis shows that the solubility of Pd in Mg does not exceed 0.55% by weight at room temperature and is ~1% by weight at the eutectic. The solubility of Mg in Pd is ≈6% by weight at the eutectic, and 5% at room temperature. The compound $MgPd_3$ found by R. Ferro (J. Metals, 1, 424 (1959)) by microstructural and X-ray analyses was not confirmed. X-ray diffraction analysis of samples, annealed at 400°C for 250 hrs, revealed that Mg_6Pd has a cubic lattice with a = 10.0 kX and proved the existence

Card 1/2